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REDESCRIPTION OF THE HIMALAIAN *PARDOSA FLAVISTERNA* CAPORIIACCO, 1935 (ARANEI: LYCOSIDAE) WITH NOTES OF THE *PARDOSA NEBULOSA* SPECIES-GROUP

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ABSTRACT

Pardosa flavisterna Caporiacco, 1935 from Karakoram, a species known by the original description only, is redescribed on the basis of syntypes and new material collected in Pakistan and India. *P. flavisterna* belongs to the *P. nebulosa* species-group, which has over 60 species. An updated diagnosis is provided for this species group and its position within *Pardosa* is briefly discussed.

Key words: distribution, India, Pakistan, wolf spiders

ПЕРЕОПИСАНИЕ ГИМАЛАЙСКОГО ВИДА *PARDOSA FLAVISTERNA* САПОРИАЦКО, 1935 (ARANEAE: LYCOSIDAE) С КОММЕНТАРИЯМИ О ГРУППЕ ВИДОВ *PARDOSA NEBULOSA*

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РЕЗЮМЕ

Pardosa flavisterna Сапориццо, 1935, вид известный из Каракорума только по первоописанию, переописан на основе типов и недавно собранного материала в Пакистане и Индии. *P. flavisterna* принадлежит к группе видов *P. nebulosa*, которая включает более 60 видов. Приведён дополненный диагноз для группы видов *P. nebulosa*. Обсуждается положение этой группы видов в роде *Pardosa*.

Ключевые слова: распространение, Индия, Пакистан, пауки-волки

INTRODUCTION

Caporiacco (1935) described 105 new arachnid species from the Karakoram region of the British India (now belonging to Pakistan and India). Six of

them belong to Lycosidae. Only two of these species, *Pardosa baltoroi* Caporiacco, 1935 and *P. tridentis* Caporiacco, 1935 have been redescribed (Buchar 1976). The other four species are known only from their original descriptions.

While identifying spiders collected recently in the Karakoram area of Pakistan, we found specimens that looked similar to *P. flavisterna* Caporiacco, 1935.

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Comparison with the type material proved them to be *P. flavisterna*, which is known only from the brief original description with poor figures. This species belongs to the large *P. nebulosa* species-group *sensu* Zyuzin (1979), which is distributed in subtropical and tropical regions of the Old World. This group has never been revised before at a global scale or in south-east Asia and males have never been properly illustrated. Based on this we decided to provide a detailed redescription of this species.

MATERIAL AND METHODS

The lectotype and paralectotypes are preserved in the Museo di Storia Naturale “La Specola” in Florence, Italy (MSNF). Other material examined is preserved in the collections of Museo Civico di Storia Naturale di Verona, Italy (MSNV) and in the Zoological Museum of the Moscow State University, Russia (ZMMU).

Pictures of habitus and of copulatory organs have been made using an Olympus SZX16 stereomicroscope with an Olympus E-520 camera and prepared using the CombineZP software. Photographs were taken in dishes of different size with paraffin at the bottom. Different sized holes were made in the bottom to keep the specimens in the correct position. Scanning electron photographs were made using the SEM JEOL JSM-5200 scanning microscope present in the Zoological Museum, University of Turku.

Smallest and biggest specimens are reported, all measurements are in millimetres. The following abbreviations are used in the text: p – prolateral; v – ventral; d – dorsal; r – retrolateral.

SYSTEMATICS

Family Lycosidae Sundevall, 1833

Genus *Pardosa* C.L. Koch, 1847

Pardosa flavisterna Caporiacco, 1935

(Figs. 1–24)

Pardosa flavisterna Caporiacco, 1935: 236, pl. 7, fig. 4 (both sexes).

Types. Lectotype – female (MSNF, here designated), INDIA: Jammu and Kashmir District, near Kangàn, Sina River bed, 2000 m, 4 April 1929, coll. L. Caporiacco [*Letto del Sino, presso Kangàn, m 2000 4 Aprile – In agris apud Kangàn, in valle fl. Sind m.*

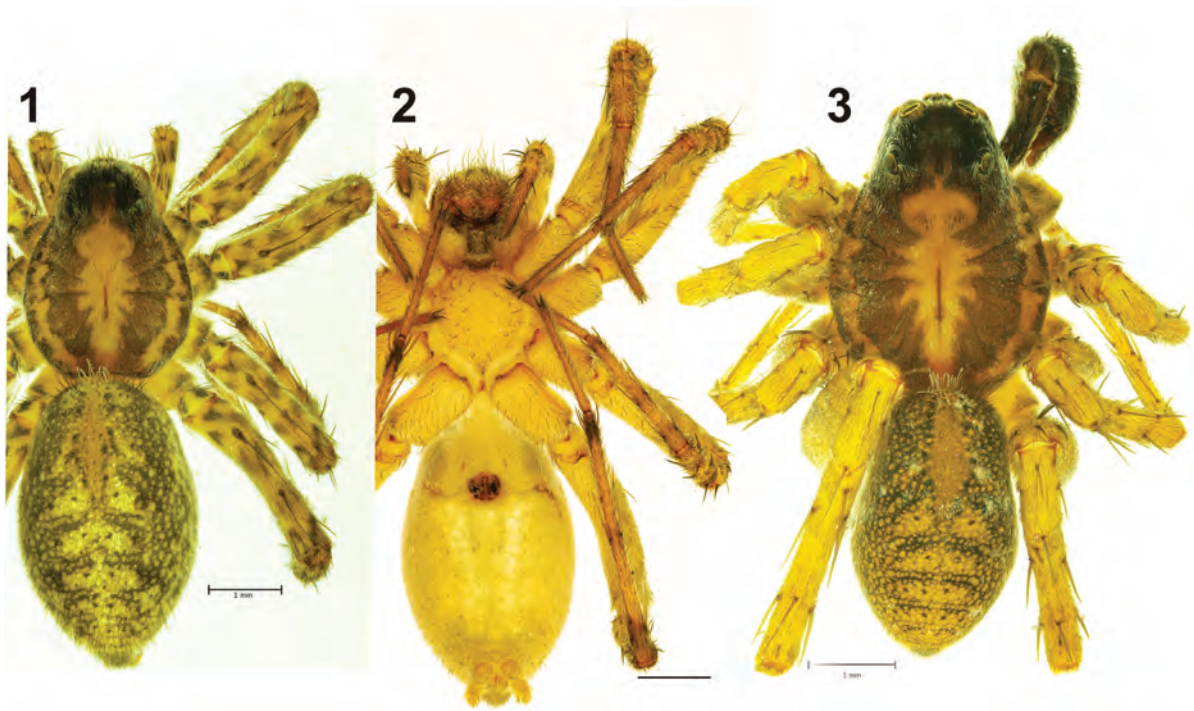
2000, die II a. Non. Apr.]; Paralectotypes – 2 males, INDIA: Jammu and Kashmir District Sindh Valley, Gund, in a field 2080 m, 9 April 1929, coll. L. Caporiacco [Gund in Val Sind, campi, m. 2080, 9 Aprile – *In agris apud Gund, in valle fl. Sind, m. 2080, die IV a. Id. Apr.*]; 1 male (MSNF), PAKISTAN: Gilgit-Baltistan, Skardu District, Shigar Valley, Kushumul Oasis, 2305 m, 26 April 1929 [*Oasi di Kushumul, pr. Shigar, m 2300 26 Aprile – In agris apud Kushumul, in valle Shigar, m. 2300, die IV a. K. Mai.*].

Other material examined. PAKISTAN: 1 male, 1 female (MSNV), Northern Areas, Gilgit District, Bagrot valley, 36°02′32.6″N 74°34′8.3″E, 2600 m, 17 June 2008, coll. L. Latella; 3 females (MSNV), Northern Areas, Gilgit District, Bagrot valley, 36°00′19.8″N 74°32′28.4″E, 2280 m, 18 June 2008, coll. L. Latella; 3 females (MSNV), Northern Areas, Shalabat, 1700 m, 15 July 1976, coll. G. Osella; 1 female (MSNV), Northern Areas, Sasli, Indus valley, 1700 m, 4 July 1976, coll. G. Osella; 2 females (MSNV), Northern Areas, Skardu Dist, Karakorum area, 2300 m, 1 July 1976, coll. G. Osella. INDIA: 40 males and females (ZMMU), [IN-11] Himachal Pradesh, Kothi Vil. and environs, 32°18′N 77°11′E, 2300–2600 m, 29 May–8 June 1999, coll. Yu.M. Marusik; 1 female (ZMMU), Himachal Pradesh, Patlikuhl Town, 32°07′N 77°08′E, 1200 m, 28–29 May 1999, coll. Yu.M. Marusik.

Note. The female was chosen as a lectotype because it is in better condition than the male, and species separation in this group is easier for females.

Diagnosis. *P. flavisterna* can be distinguished from other congeners by the shape of copulatory organs, especially by the proportion of epigynal septum. We can not provide detailed diagnosis because the group is poorly studied.

Description. *Female.* Total length: 6.45–8.95. Carapace: 3.2–4.3 long; 2.4–3.2 wide; brown, median band brownish-yellow with branched sides, dilated in cephalic area and with 2 small darker spots inside (Fig. 1). Lateral bands with irregular edges, usually broken into 3 spots separated from each other by thin brown lines. Sternum yellow, in some specimens with light brown spots (Fig. 2). Abdomen dark with distinct reddish-brown heart mark bordered by black, flanked and followed by couple of yellow spots. Spots fused in posterior area of abdomen. Ventral side of abdomen light yellow with 2 parallel lighter strips united in middle (Fig. 2). Legs reddish-yellow with brown annulations. Leg I length: 2.77+1.32+2.5+2.37+1.6.



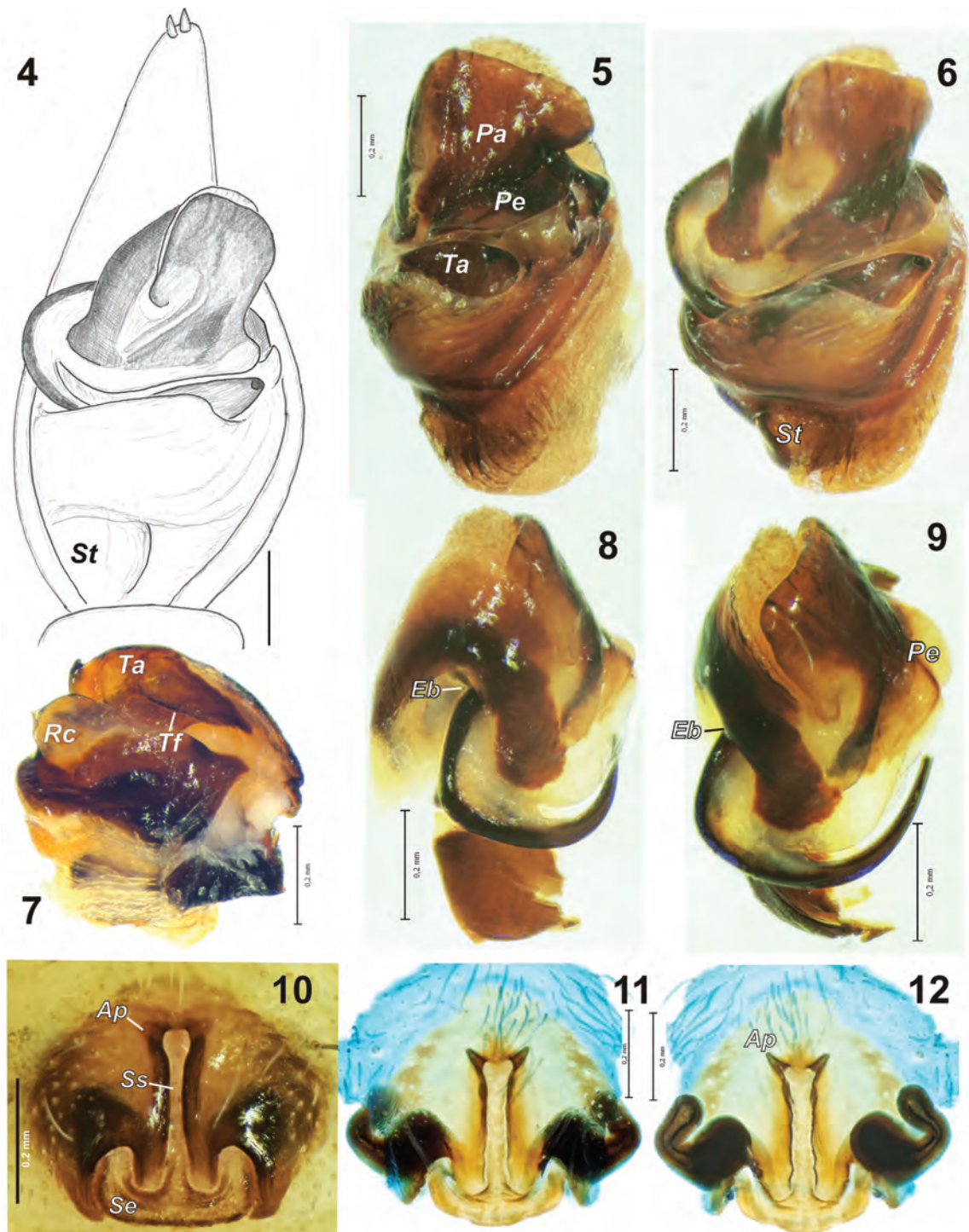
Figs. 1–3. Habitus of *Pardosa flavisterna* from Baltistan. 1 – female, dorsal; 2 – female, ventral; 3 – male dorsal.

Leg I spination: femur d2 p2 r2, patella d1, tibia p2 r2 v2–3, metatarsus p3 r3 v2–2. Epigyne as in Figs. 10–12, with 2 small apical pockets (*Ap*) and without fovea; septum (*Se*) anchor like; stem of septum (*Ss*) long and thin, its length about 1.2 times longer than septum width, septal stem 12 times thinner than septum; receptacula relatively short, not stretched upward like in most of *Pardosa* s.l.

Male. Total length: 5.95–6.65. Darker than female. Carapace: 3.05–3.35 long; 2.3–2.65 wide; carapace brown-black with yellow-brownish median band branched in middle and dilated anteriorly (Fig. 3). Two darker spots inside dilation. Lateral bands with irregular edges and broken in 3 spots as in female, sometimes broken in 4 spots. Chelicerae darker than in female. Sternum brown with 1 spot or narrow yellow strip in middle. Abdomen with reddish-brown heart mark bordered by black. Six pairs of yellow spots surround and follow heart mark and united near spinnerets. Legs reddish-yellow with few brown spots. Palps dark, almost black. Leg I length: 2.7+1.17+2.25+2.6+1.42. Leg I spination: femur d3 p2 r2; patella d2 p1 r1; tibia d2 p2 r2 v3–3; metatarsus p4 r4 v2–2.

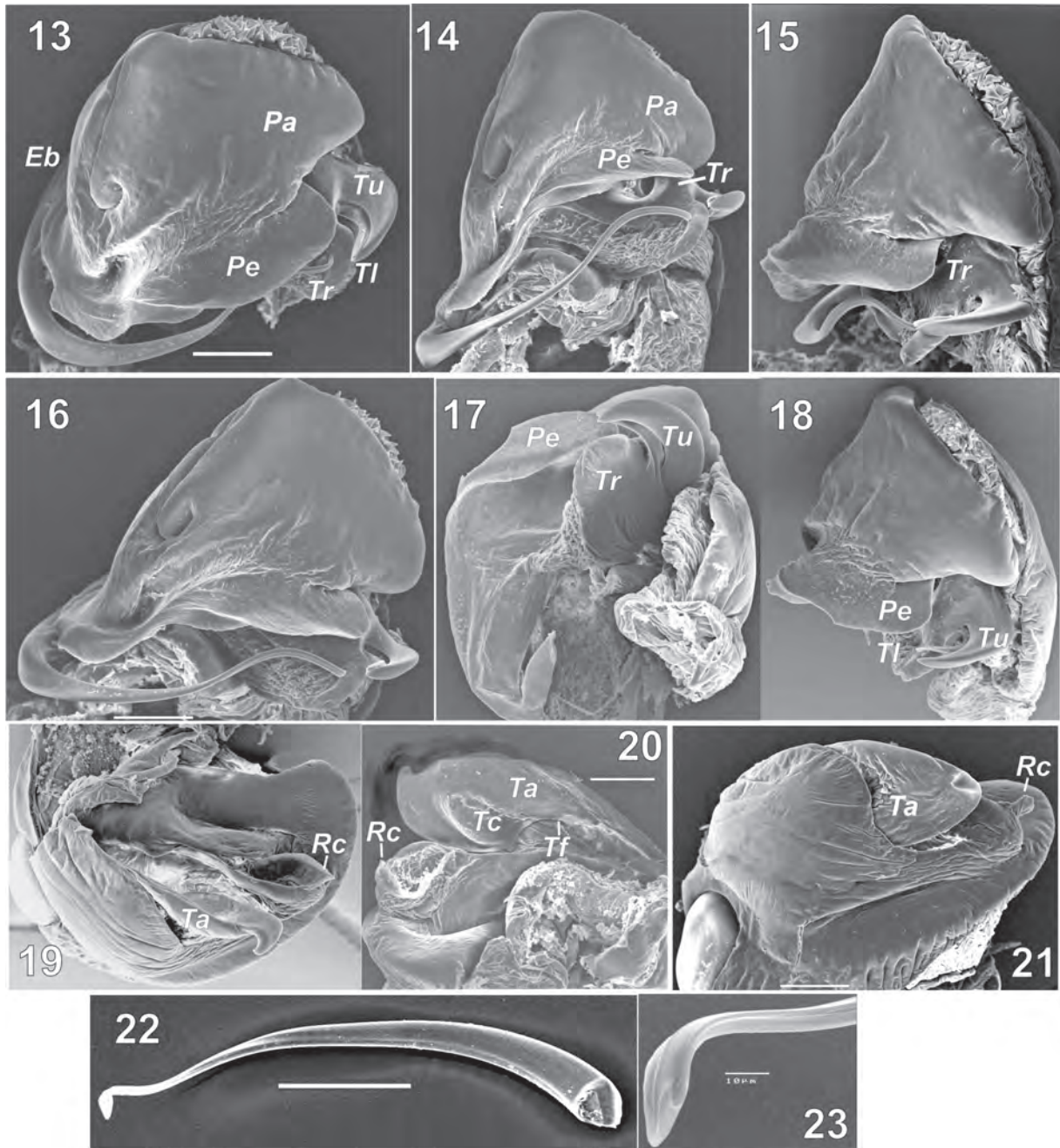
Palp as in Figs. 4–9, 13–23; cymbium and tibia black, cymbium with 2 strong teeth; subtegulum (*St*) large, paced on prolateral side; tegular apophysis (*Ta*) transversal, wider than high, with only 1 arm (apical arm absent), inner side of tegular apophysis with distinct furrow (*Tf*) and cavity (*Tc*); embolus (*Eb*) long and thin, it starts from dorsal side of bulbus, tip slightly widened; palea (*Pa*) large and high, with kind of peak (*Pe*) in proximal part, which partly covers embolus; “conductor” (*Tr*) (or terminal apophysis, homology unclear) with two terminal processes, the upper one (*Tu*) and lower one (*Tl*); resting conductor (*Rc*) small. Carapace/tibia length ratio of both sexes shown in Fig. 25.

Distribution. According to Caporiacco (1935), this species was abundant in Kashmir and Baltistan between 1700 and 3500 m. In more southern areas, in northern India, it was collected at elevations from 1200 m to 2600 m. According to the present data, this species is distributed from the Baltistan area in Pakistan to northern Himachal Pradesh (Fig. 24). New records from India extend the known range by some 300 km to the south-east.



Figs. 4–12. Colpulatory organs of *Pardosa flavisterna* (specimens from Baltistan). 4 – male palp, ventral; 5 – bulbus, retrolateral; 6 – bulbus, ventral; 7 – tegulum, from above; 8 – embolic division, prolateral; 9 – embolic division, prolateral-ventral; 10–11 – epigyne, ventral; 12 – epigyne, dorsal. 11–12 – epigyne after maceration.

Abbreviations: Ap – apical pockets, Eb – embolus, Pa – palea, Pe – palea peack, Rc – resting conductor, Se – septum, Ss – stem of septum, St – subtegulum, Ta – tegular apophysis, Tf – tegular apophysis furrow.



Figs. 13–23. Male palp of *Pardosa flavisterna* (specimens from Himachal Pradesh). 13 – terminal part of bulbus, ventral-from above; 14 – same, ventro-caudal; 15 – same, retrolateral; 16 – same, ventral; 17 – same, caudal; 18 – same, retrolateral – from above; 19 – tegulum, from above; 20 – same, dorsal; 21 – same, ventral; 22 – embolus; 23 – embolic tip. Scale = 0.1 mm if not otherwise indicated.

Abbreviations: *Eb* – embolus, *Pa* – palea, *Pe* – palea peack, *Rc* – resting conductor, *Ta* – tegular apophysis, *Tc* – tegular apophysis cavity, *Tf* – tegular apophysis furrow, *Tl* – “conductor” lower terminal process, *Tr* – “conductor”, *Tu* – “conductor” upper terminal process.



Fig. 24. Distribution of *Pardosa flavisterna*, arrow indicates type locality.

COMMENTS

Pardosa C. L. Koch, 1847 is one of the largest genera within the order and the largest genus of the family Lycosidae. Currently 554 species are attributed to this genus (Platnick 2010). Judging from the somatic morphology and morphology of the copulatory organs *Pardosa* remains a polyphyletic genus, although some species have been moved from the genus to other genera or even to other tribes and subfamilies (e.g., several species were moved to *Wadicosa* Zyuzin, 1985, *Wadicosinae* Zyuzin, 1985).

The genus was split into 22 species groups by Zyuzin (1979), who however considered only north Palaearctic species. He assigned four species to the *P. nebulosa*-group. Zyuzin (1979) diagnosed this group as follows: females with the anchor-shaped septum, and males with the horizontal semitransparent tegular apophysis. Based on the detailed studies of *P. flavisterna* we can extend the definition of this group. In addition to the horizontal tegular apophysis, the inner side of the apophysis has a furrow (absent in other *Pardosa* species); the apical arm of the tegular apophysis absent; cymbium appears to always have two claws (from one to three in *Pardosa* s. l.); the subtegulum large and turned to the proteral side (smaller in *Pardosa* s. l., and placed in the centre);

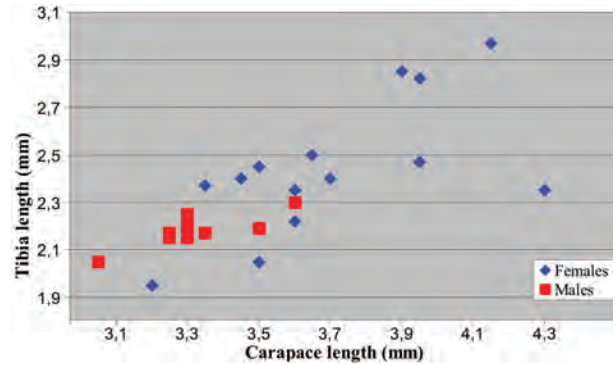


Fig. 25. Graphic carapace/tibia length ratio of males (red squares) and females (blue diamonds).

the posterior part of the palea with lamina (peak) (no such lamina in other *Pardosa* s. l.); embolus starts behind the bulbus (base of embolus visible in ventral view of the palp, it starts in the proteral part of the bulbus in *Pardosa* s. l.).

Some of the characters mentioned are plesiomorphic (large and proterally placed subtegulum, horizontal, flat tegular apophysis with one arm and furrow). Such characters can be found in the Lycosinae (for example *Alopecosa*). Another character (high palea surrounded with lamina in the posterior part) seems to be an autapomorphic character not seen in other *Pardosinae* or *Lycosinae* that we have studied to date.

Zyuzin (1979) mentioned four species in this group. Alderweireldt and Jocqué (1992) added eight species in their revision of African representatives of the *P. nebulosa*-group. Recently, Eshyulin et al. (2007) listed 26 species belonging to *P. nebulosa*-group. According to our calculations and checking figures in the literature this species group encompasses at least 66 species distributed in south Palaearctic, India, Southeast Asia, and Africa. We were not able to check the conformation of the male palp or epigyne in over 80 species due to a lack of figures or unavailability of the literature. However, it is likely that some of these species may belong to the *P. nebulosa*-group.

We believe that this species group deserves the status of a separate genus. There is at least one available name for this group. *Chorilycosa* Roewer, 1960 was described for *Lycosa arorai* Dyal, 1935 now considered as a junior synonym of *P. sumatrana* (Thorell, 1890). *Lycosa arorai* was described from Punjab (Pakistanian part). The description is very poor, and

it is not clear how this species was synonymised with *P. sumatrana*, although it is very likely that *L. arorai* is a member of the *P. nebulosa*-group. In the adjacent Indian Punjab this species group is very common.

Another possible generic name for *P. nebulosa*-group is *Acroniops* Simon, 1898 with the type *A. heterophthalmus* Simon, 1898 from Java. This genus is now considered as a junior synonym of *Pardosa*. The species remains known only by the holotype female. The figure of the holotype made by Roewer (1959: f. 89) fits the *P. nebulosa*-group, although the figure of the epigyne of the holotype provided by Tikader and Malhotra (1980: 346, fig. 198) does not resemble the epigynal configuration of the *P. nebulosa*-group.

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